

## Essay

### \$\$\$001

Pharmacological properties and toxicity of organic compounds

### \$\$\$002

Innovative processes of teaching chemistry at the university

### \$\$\$003

Modern educational trends

### \$\$\$004

The effectiveness of the use of innovative methods in teaching general and inorganic chemistry.

### \$\$\$005

Solving environmental problems in teaching chemistry

### \$\$\$006

Methods for studying the qualitative and quantitative chemical composition and functional groups in organic compounds.

### \$\$\$007

Development of chemical sciences

### \$\$\$008

World traditions and modern methods of teaching chemistry

### \$\$\$009

Scientific and pedagogical research-the process of forming new pedagogical knowledge

### \$\$\$0010

Chemical metals and compounds obtained by electrolysis

## Questions

### ###001

Regularities of the development of chemical science and regularities of knowledge assimilation as a methodological basis for teaching chemistry.

### ###002

System-structural approaches to the construction of the content of the chemistry course

### ###003

Individualization and differentiation of chemistry training as a way to implement personality-oriented chemistry training. Methods of differentiation of students' academic work and tasks in chemistry.

### ###004

Basic concepts of chemistry and their evolution: atom, chemical element, molecule, chemical compound, structure of matter, chemical reaction.

### ###005

Concepts of chemical education, new educational paradigms and the main directions of modernization of chemical education.

###006

Formation of the main tasks and goals of teaching inorganic chemistry.

###007

Teaching chemistry as a pedagogical system, its features: goals, content, methods and technologies of teaching, means and forms of organization of the educational process, control of students' knowledge.

###008

Content and structure of the course of inorganic chemistry. Periodic law of D. I. Mendeleev as a theoretical basis for the construction of inorganic chemistry.

###009

Didactic principles of teaching chemistry: scientific character, accessibility, clarity and consistent complexity of the course content.

###010

The result of the introduction of new material in the educational process. Modern methods and technologies of teaching at the university.

###011

Methods of teaching chemistry as a science and academic discipline in higher education. The place of didactics of chemistry in the system of pedagogical sciences.

###012

A method of teaching inorganic chemistry with the integration of electronic and multimedia systems.

###013

Modern organizational forms of interactive teaching of inorganic chemistry. Evaluation of the effectiveness of teaching inorganic chemistry in the point rating at the intermediate control.

###014

Features of teaching inorganic chemistry in the transition to the credit learning process.

###015

Methods of teaching the main sections of inorganic chemistry.

###016

Describe analytical chemistry as a science

###017

Describe the types of chemical analysis and how they are classified

###018

Describe the modern stage of development of analytical chemistry.

###019

Solution theory in analytical chemistry

###020

Protolytic theory of acids and bases.

###021

Autoprotolysis. Hydrogen and hydroxide parameters pH and pOH

###022

What is called the degree of dissociation of the electrolyte? Give examples of strong and weak electrolytes, and calculate their pH

###023

What is the ion activity coefficient and ionic strength of the solution?

###024

Buffer solutions used in the analysis

###025

Buffer capacity and calculation of the pH of buffer solutions

###026

Hydrolysis of salts. What is the degree of hydrolysis and the hydrolysis constant, calculating the pH of hydrolyzed salts

###027

Complex compounds in chemical analysis. Classification of complex compounds

###028

Stability and instability constants of complex compounds

###029

Oxidation-Reduction (Redox) reactions in chemical analysis. Redox potential, Nernst equation

###030

Give examples of typical oxidizing agents and reducing agents. How does the oxidation state of the elements change during oxidation and reduction?

###031

Chemical equilibrium in heterogeneous systems. The solubility product and solubility

###032

Conditions of precipitation formation in precipitation reactions

###033

The nature of the covalent bond. Electronic effects. Acids and bases

###034

Alkanes. Methods of preparation, chemical properties and application. Mechanism of radical substitution reaction in alkanes (SR).

###035

Cycloalkanes. General formula for cycloalkanes. Types of isomerism. Bayer theory. Methods for obtaining three-, five- and six-part cycles. Chemical properties of alicyclic hydrocarbons.

###036

Stereoisomerism. Spatial structure of organic compounds. Isomerism. Basic principles of Systematic Nomenclature (IUPAC) and Rational Nomenclature.

###037

Alkenes. Methods of preparation, chemical properties and application. Zaitsev's rule. The mechanism of the electrophilic addition reaction (AdE) in alkenes. Markovnikov's rule. The Karash effect.

###038

Alkynes. Methods of preparation, chemical properties and application. Acidic properties of acetylene and its derivatives. Reactions of nucleophilic addition of alkynes. Kucherov's reaction.

###039

Dienes. Methods of obtaining. Structure of 1,3-butadiene. Classification of dienes - cumulated, conjugated, and isolated. 1,2 - and 1,4 – addition reactions.

###040

Halogen derivatives of alkanes. Classification and nomenclature . Methods of preparation, chemical properties.

###041

Organoelement compounds. Organometallic compounds. Structure. Methods of obtaining. Reactions.

###042

Alcohols. Methods of preparation, chemical properties and application. Acid-base properties of alcohols. The reaction of dehydration of alcohols. Zaitsev's rule.

###043

Polyatomic alcohols. Structure and reactions.

###044

Simple ethers. Methods of preparation, structure, and reactions.

###045

Aldehydes and ketones. Electronic structure of the carbonyl group. Methods of obtaining. Physical and chemical properties. Oxidation-reduction reactions.

###046

Carboxylic acids and their derivatives. Synthesis of functional derivatives of carboxylic acids (anhydrides, chlorohydrates, esters, amides).

###047

Saturated carboxylic acids and their derivatives. Electronic structure of the carboxyl group. Nomenclature. Methods of obtaining.

###048

Unsaturated carboxylic acids and their derivatives. Methods of obtaining. Reactions.

###049

Orientation rules in electrophilic aromatic substitution: ortho -, para-orientants (substituents of the first row); meta-orientants (substituents of the second row).

###050

Orientation rules and reactivity of substituted benzenes from the standpoint of the theory of molecular orbitals. Electrophilic substitution in polysubstituted benzenes: consistent and inconsistent orientation; unco-substitution reactions.

###001

Methods of organizing independent work of undergraduates.

###002

Problems of distance learning in inorganic chemistry.

###003

Types of cognitive tasks in chemistry.

###004

Cognitive tasks as an organizational and managerial tool for teaching chemistry.  
###005

Methods of teaching general chemistry, their brief description. Classification and grouping of methods used in teaching chemistry. Special methods of teaching chemistry.

###006

General logical and general pedagogical methods in the process of teaching chemistry.

###007

Modern technologies of teaching chemistry. The reasons for the formation and current trends in the development of technologization of chemistry education.

###008

Solving chemical problems as a method of studying chemistry. The role and functions of computational problems in teaching chemistry.

###009

Basic theoretical problems of inorganic chemistry.

###010

Methodological foundations of content integration in the teaching of chemistry. Integrative courses "Natural science" and "General chemistry" in chemical education.

###011

Educational technology, its essence and structure. The focus of educational technologies on the result-the acquisition of new knowledge, the development of skills and key competencies.

###012

Subject and inter-subject connections, their didactic purpose and ways of implementation in the teaching of chemistry.

###013

Chemical reactions of substances in various aggregate states.

###014

Features of designing and conducting chemistry lessons. Solving and composing problems in chemistry.

###015

The project method in teaching inorganic chemistry.

### 016

Conducting a class on the classification of inorganic substances based on the method of debate.

### 017

Modern methods of teaching general and inorganic chemistry

### 018

Factors affecting the solubility of precipitates in precipitation reactions

### 019

Organic reagents used in analytical chemistry

### 020

Name the areas of use of organic reagents, give examples

### 021

Separation and concentration methods

### 022

Extraction method. Extraction of organic substances and metal ions

### 023

Qualitative chemical analysis. Fractional and systematic ion analysis

### 024

Classification of cations and anions

### 025

Quantitative analysis. Tasks of quantitative analysis

### 026

Methods for expressing the concentration of solutions

### 027

What is the essence of gravimetric and titrimetric analysis?

### 028

The essence of titrimetric analysis. Basic methods of titrimetric analysis

### 029

Titration methods (direct, reverse, and indirect). Calculations in titrimetric analysis

### 030

Acid-base titration. Acidimetric and alkalimetric titration.

### 031

Indicators of Acid-base titration

### 032

Titration curves and indicator selection in acid-base titration

### 033

Complexometric titration. Complexons

### 034

Sulfonic acids (sulfonic acids). Methods of preparation, chemical properties.

###035

Nitro compounds. Methods of obtaining. Physical and chemical properties. .  
Konovalov's reaction.

###036

Amines. Primary, secondary, and tertiary amines and chemical properties.

###037

Diaz compounds. Classification and nomenclature. Physical properties and structure. Methods of obtaining. Reactions.

### 038

Heterocyclic compounds. Five-membered heterocyclic compounds. Pirol, furan, thiophene. Physical properties and structure.

### 039

Heterocyclic compounds. Condensed five-membered heterocyclic compounds. Indole. Methods of obtaining.

### 040

Heterocyclic compounds. Six-membered heterocyclic compounds. Pyridine. Methods of obtaining.

###041

Carbohydrates. Monosaccharides. Disaccharides. Polysaccharides. Structure and classification.

###042

Amino acids, peptides, and proteins. Structure and classification. Methods of obtaining. Chemical properties.

### 043

Nucleic acids. Structure.

### 044

Cycloalkanes. Methods of obtaining. Physical properties and structure.

### 045

Cycloalkanes. Types of tension and the nature of connections. Features of the spatial structure of some cycloalkanes. The nature of bonds in cyclopropane.

### 046

Aromatic compounds, aromaticity criteria.

### 047

Benzene. Structural formula of benzene; conjugation energy; electronic structure of benzene.

### 048

Rules of aromaticity. Annulenes and their ions: Annulenes; NMR criteria for aromaticity; Aromatic ions; Quantum chemical determination of aromaticity; Graphical method for determining aromaticity.

### 049

Condensed benzoid hydrocarbons. Non-benzoid aromatic compounds.

### 050

Electrophilic substitution in the aromatic series: the mechanism of electrophilic aromatic substitution reactions. Electrophilic aromatic substitution reactions: benzene halogenation; benzene sulfonation; benzene nitration; Friedel-Crafts alkylation; Friedel-Crafts acylation; arene reactions with other electrophiles.

###001

Discussion of metal chemistry topics

###002

Application of modern methods on the general properties of metals, their distribution in nature, extraction.

###003

Using interactive methods on the topic of Group 1 metals in the periodic table

###004

Implementation of feedback on the chemistry of nonmetals

###005

Conducting the topic of changes in the properties of nonmetals in connection with the position of D. I. Mendeleev in EPG on the basis of a problem situation

###006

General properties of nonmetals, their distribution in nature, the method of critical analysis of the topic

###007

Elements of Group VI. Conducting the topic of oxygen with the help of interactive training

###008

Water. Abnormal properties of water. Using a modular process on the topic of hydrogen peroxide

###009

Elements of group V. Application of the case method on the topic of phosphorus

###011

Application of new methods in the field of nitrogen extraction, physical and chemical properties

###012

Elements of group IV. Carbon. Conducting a discussion on the topic of silicon

###013

Elements of group III. Modern methods of teaching the topic of Boron.

###014

Snowstorm. Using interactive methods on topic karboranov

###015

Features of the use of the case method on the topic of inorganic transformations of circuits

###016

Conducting a description of the elements of group VIII on the basis of problematic questions on the topic.

###017

Modern methods of teaching the subject noble (inert) gases

###018

Indicators of complexometric titration

###019

Complexometric titration curves

###020

Redox titration. Classification of redox titration

###021

Redox titration curves

###022

Applicable indicators of redox titration

###023

Permanganatometry. Preparation and standardization of potassium permanganate

###024

Iodometry. Working solutions. Indicators

###025

Methods of precipitation titration. Argentometry

###026

Precipitation titration curves. Applicable indicators

###027

Gravimetric analysis. Calculations in gravimetric analysis

###028



Method of distillation, separation and deposition in gravimetric analysis

###029

Optical methods of analysis. Bouguer-Lambert-Beer law

###030

Photocolorimetric and spectrophotometric analysis

###031

Electrochemical methods of analysis. Classification. Potentiometry.

###032

Voltammetry. Polarography. Amperometric titration .

###033

Chromatography. Classification of chromatography methods

###034

Gas and liquid chromatography

###035

Alkylbenzenes and alkenbenzenes: nomenclature of benzene derivatives; methods for the preparation of alkylbenzenes; physical properties of alkylbenzene; reactions of alkylbenzene.

###036

Alkenylbenzenes: methods for the production of styrene and its derivatives. Reactions.

###037

Polycyclic aromatic hydrocarbons. Polycyclic arenas with isolated cycles. Methods for the production of biphenyl derivatives. Structure of biphenyl derivatives. Reactions of biphenyl derivatives.

###038

Condensed benzoid hydrocarbons Production methods. Reactions.

###039

Spectral methods for the identification of organic substances.

###040

Halogenarenes. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. Nucleophilic halogen substitution in activated haloarenes (S<sub>N</sub>Ar). Nucleophilic halogen substitution in non-activated haloarenes. Nucleophilic halogen substitution catalyzed by copper.

###041

Phenols. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. Acidity.

###042

Aromatic aldehydes and ketones. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. Specific properties of aromatic aldehydes.

###043

Aromatic carboxylic acids. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions.

###044

Sulfonic acids. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. Acidic properties.

###045

Aromatic nitro compounds. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. CH-acidity.

###046

Aromatic amines. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions. Acid-base properties. Electrophilic substitution in aromatic amines.

###047

Aromatic diazo -, azo-compounds. Classification and nomenclature. Methods of obtaining. Physical properties and structure. Reactions.

###048

Heterocyclic compounds. Classification and nomenclature. Five-membered heterocyclic compounds. Pirol, furan, thiophene.

###049

Six-membered heterocyclic compounds. Pyridine.

###050

Carbohydrates. Monosaccharides. Disaccharides. Polysaccharides